



PigKnob User Guide



Version 1.0C

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Document Overview

This document serves to guide PigKnob users through the use of the system. The perspective of this guide is from the point of view of a user who has just unpackaged the device. To start, we'll cover the various components involved in the system.

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Community Support

A Yahoo Group has been created for PigRemote. Please consider joining the group to receive information about updates, ask questions or report problems. If you know the answer to a question posed by another user, please feel free to help out.

[PigKnob Yahoo Group](#)

Introduction

PigKnob is a remote tuning knob for amateur radios that use a plain text CAT protocol for rig control such as Elecraft, Kenwood and newer Yaesu radios. This document gives an overview of the device and its operation.

PigKnob Device Overview

Theory of Operation

PigKnob is a remote tuning knob. It has 8 tactile switches and an optical rotary encoder with built-in switch. The device is controlled by a Microchip PIC18F26K22 running off 5 volts supplied by an internal LDO voltage regulator. TTL <-> RS-232 level conversion is facilitated by a MAX3232 IC.

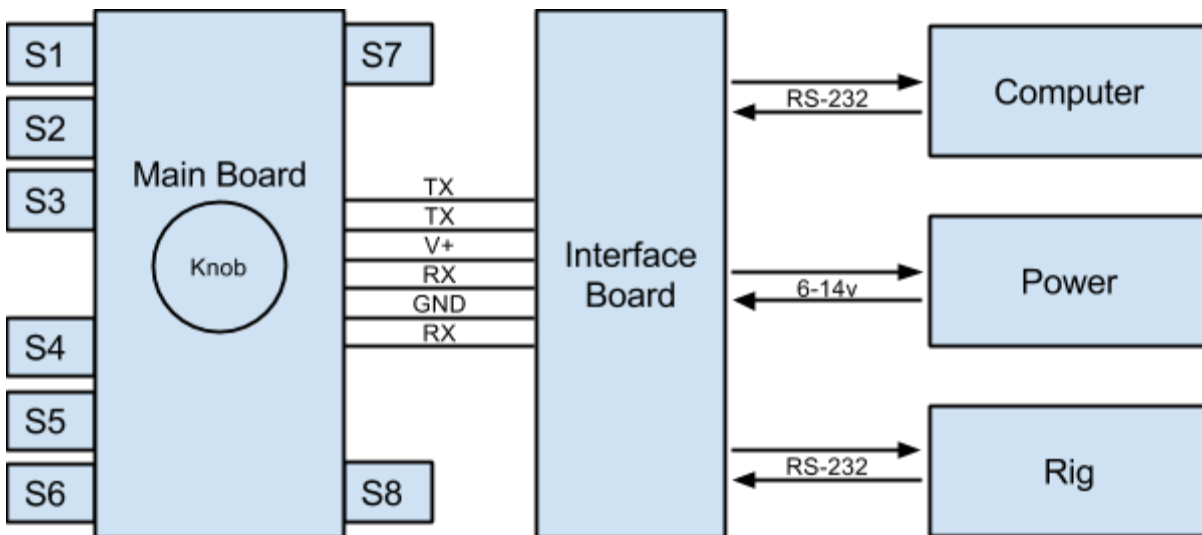
There are two boards connected by 6 conductor ribbon cable with RJ-12 connectors on each end. The smaller board contains the two serial connections and power jack. The reason for the separate interface board is to reduce the number of cables coming out of the back of the device. The ribbon cable can be replaced by standard 6P6C silver satin phone cord if you need to increase the distance between the two boards.

Each function on the device (switches and knob rotations) can be user configured to output a plain-text string of ASCII characters to the radio.

NOTE: Radio's that do not use a plain-text CAT control protocol such as the older Yaesu FT-8X7 and Icom radios will not work with this knob.

There are two serial ports on the PigKnob interface board. One for a computer and one for an amateur radio. The PigKnob allows you to connect the PigKnob in-line between the computer

and radio as it will proxy all serial data received from the computer out to the radio and vice versa.



Block Diagram

The schematic for the PigKnob is available in the [Schematic](#) section.

Quick Start Video

If you prefer a video example of the following instructions, the quick start video at the following URL walks you through the connections, configuration and use of the PigKnob directly out of the box.

http://youtu.be/uU8_78j3pqc

Installation

The system is on or off based on whether or not the power supply is plugged in. The voltage regulator accepts a maximum of 15 volts input with a minimum of 7 volts.

Ribbon Cable

The ribbon cable between the main board and the satellite interface board should be connected first. The power from the power supply is carried on this cable to the main board.

The satellite interface board is not in an enclosure as it's expected to hang behind your desk, out of sight. There are 4 large holes in the PCB allowing for cable ties to be used if you wish to attached the board to something. Take care not to short any of the pins on the bottom of the PCB.

Power

The supplied power cable has bare leads on one side and a 2.1mm ID, 5.5mm OD barrel connector on the other side. The wire with the white stripe is positive. When the device is plugged in, it is on.

RS-232 Rig Connection

The RS-232 rig connection is the male DE9 connector on the satellite interface board. It is wired as a [DTE Device](#). The connection from this port to your radio will be based on the connection options of the radio. For example, for an Elecraft K3 you should use a standard straight through serial cable. For the Elecraft KX3, you would use the Elecraft KXSER cable.

RS-232 Computer Connection

The RS-232 computer connection is the female DE9 connector on the satellite interface board. It is wired as a [DCE Device](#). A straight through serial cable should be used to connect this port to the computer.

PigKnob Configuration

Every physical function (switches and encoder spins) on the PigKnob can be configured. The configuration of the PigKnob is accomplished through the computer serial port on the satellite interface board.

NOTE: While in config mode, all data received on the computer serial interface on the interface board is interpreted as a config command and will not be proxied over to the radio. If the LED is blinking, the device is in config mode and your rig control software will not be able to control the radio through the PigKnob.

Terminal Connection

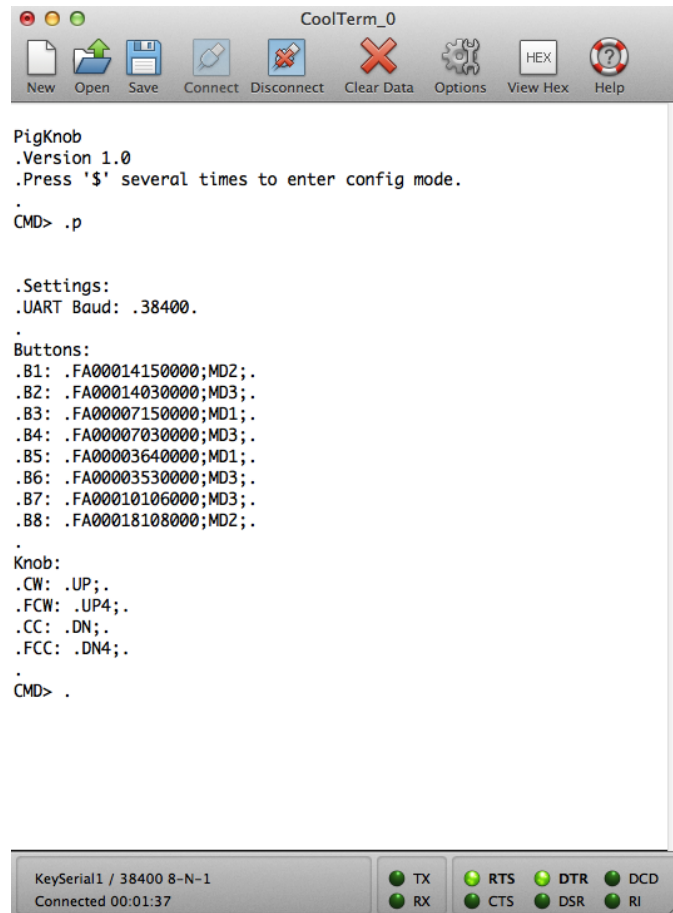
Using a standard terminal emulator such as TeraTerm on Windows, or Minicom on Mac/Linux. Open the COM port connected to the PigKnob with the following settings.

Default Serial Port Configuration

Parameter	Default Setting
Baud	38400
Data Bits	8
Parity	None
Stop Bits	1

NOTE

The serial library in use on the PIC MCU sends nulls (0x00) following a write. Some terminal emulators display these nulls for some reason. They might show up as "." or "<0>". If you experience this, try a different terminal program. Those mentioned above do not experience this issue. CoolTerm on Mac will display a "." as displayed in the following picture.



```
PigKnob
.Version 1.0
.Press '$' several times to enter config mode.
.
CMD> .p

.Settings:
.UART Baud: .38400.
.
Buttons:
.B1: .FA00014150000;MD2;.
.B2: .FA00014030000;MD3;.
.B3: .FA00007150000;MD1;.
.B4: .FA00007030000;MD3;.
.B5: .FA00003640000;MD1;.
.B6: .FA00003530000;MD3;.
.B7: .FA00010106000;MD3;.
.B8: .FA00018108000;MD2;.
.
Knob:
.CW: .UP;.
.FCW: .UP4;.
.CC: .DN;.
.FCC: .DN4;.
.
CMD> .
```

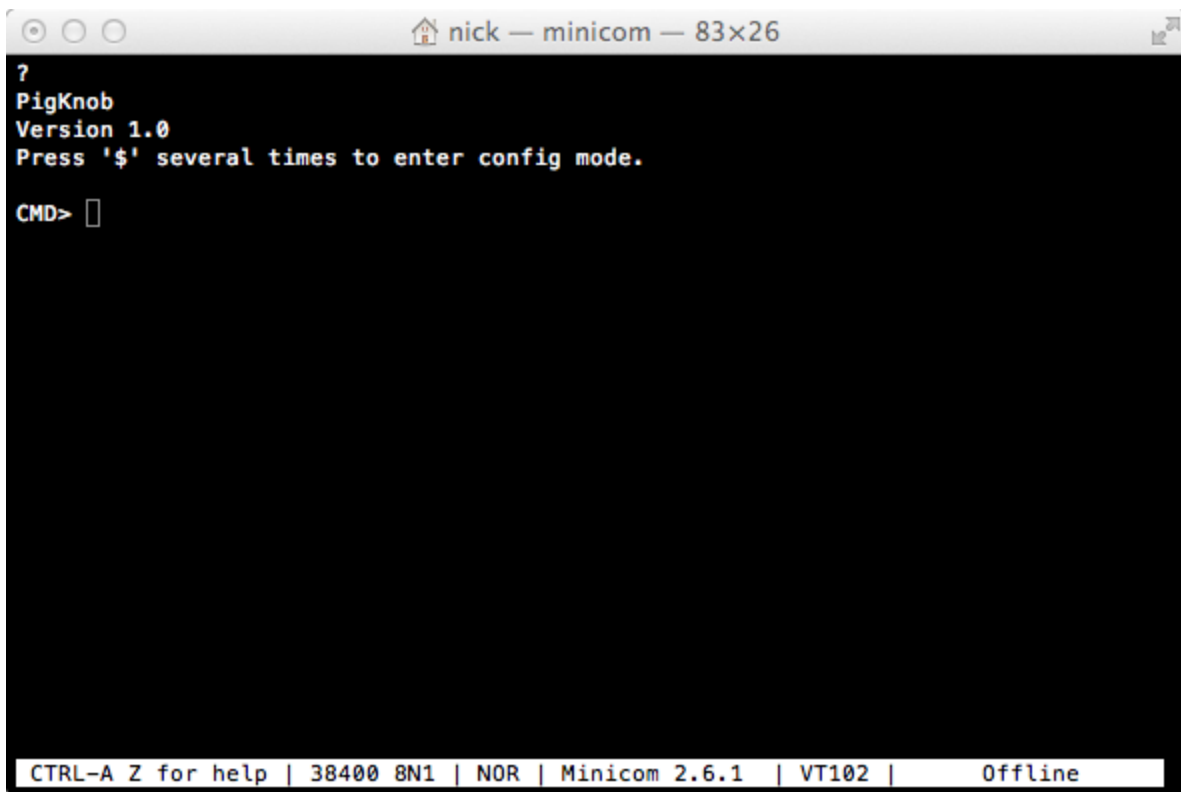
KeySerial1 / 38400 8-N-1
Connected 00:01:37

TX RX RTS CTS DTR DSR DCD RI

Configuration

Once you have the connection up, press “\$\$\$” several times to be presented with a “CMD>” prompt.

The following image shows Minicom running in Terminal on Mac. The text above “CMD>” is what is displayed when the PigKnob is plugged in. You won’t see this unless you remove and reapply power to the PigKnob. After boot, “\$” was pressed several times to get into command mode.



```
?
PigKnob
Version 1.0
Press '$' several times to enter config mode.
CMD> 
```

CTRL-A Z for help | 38400 8N1 | NOR | Minicom 2.6.1 | VT102 | Offline

Minicom on Mac

When the PigKnob is in command mode the LED on the front of the device blinks rapidly. When not in config mode the LED is on, no blinking.

NOTE: Spinning the knob while in config mode can have erratic results on the radio’s frequency. Exit command mode to test any changes to the knob commands.

The following elements of the PigKnob can be configured.

Function	Description
Baud	The baud rate used on both serial ports. The baud rates on both serial ports must be the same to avoid overrunning the internal buffers. There is a single command to modify the baud rate on both serial ports (computer and rig).
B1-B8	The plain-text command that will be sent out the radio serial port when the corresponding button is pressed.
Encoder Clockwise (fast and slow)	The plain-text command that is sent out the radio serial port when the knob is rotated clockwise. Fast mode is toggled on or off by pressing down on the encoder.
Encoder Counter-Clockwise (fast and slow)	The plain-text command that is sent out the radio serial port when the knob is rotated counter-clockwise. Fast mode is toggled on or off by pressing down on the encoder.

The following commands can be executed in config mode to change/view settings. You will need to refer to the Owner's Manual for the radio you're controlling to determine what commands to put in here. Changes to the configuration are immediate.

All commands are case sensitive, always use lowercase for commands. Macro text can be any case. Most radios ignore case of control commands.

You should refer to the Programmer's Reference for your particular radio when setting commands that are sent when buttons are pressed. For Elecraft, the E11 version of the Programmer's Reference can be found here:

<http://www.elecraft.com/manual/K3&KX3%20Pgmr%20Ref.%20E11.pdf>

The most up to date version of this Programmer's Reference can be found here:

http://www.elecraft.com/K2_Manual_Download_Page.htm#K3

For other radio's, the control commands are usually in the User's Manual.

Please Note: In certain scenarios you may need to preface a macro command with a semi-colon, ';'. This will ensure the radio resets its command buffer and interprets your command correctly. For example, rather than setting B1 to "MD1;" set it to ";MD1;".

Command	Description
p	Print the current settings. Example output:

	<p>CMD> p</p> <p>Settings: UART Baud: 38400</p> <p>Buttons: B1: FA00014150000;MD2; B2: FA00014030000;MD3; B3: FA00007150000;MD1; B4: FA00007030000;MD3; B5: FA00003640000;MD1; B6: FA00003530000;MD3; B7: FA00010106000;MD3; B8: FA00018108000;MD2;</p> <p>Knob: CW: UP; FCW: UP4; CC: DN; FCC: DN4;</p>
h	Print the help information.
q	<p>Exit config mode and return to normal operation. Example output:</p> <pre>CMD> q 73 de N3WG, Pignology, LLC BTU...</pre> <p>NOTE: It will not return to the "CMD>" prompt when you quit config mode.</p>
FRFR	<p>Reset the device to the factory defaults. NOTE: An alternative to this command is to hold down S1 while applying power to the device. Release the switch after about 2 seconds and it will reset the EEPROM contents to the as shipped configuration.</p> <p>Example output:</p> <pre>CMD> Resetting to factory defaults, you don't need to restart. You might need to change baud to 38400. Defaults loaded CMD></pre>
r #	<p>Set baud rate for both UARTs. "#": 1=38400, 2=19200, 3=9600 Serial port parameters are fixed at 8-N-1. The microcontroller in the PigKnob doesn't support 2 stop bits. 38400 is the default Example output:</p> <pre>CMD> r 2 Set UART baud 19200.</pre> <p>NOTE: At this point you would need to change the baud rate of your computer's serial port to start talking to the device again.</p>

b # <text>	<p>b# <TEXT> = Set macro button # to <TEXT>. Max length = 100. E.g. b1 FA00014060000;MD3; Use ` for CR and ~ for LF if needed. That's backtick and tilde.</p> <p>Example output: CMD> b1 KY BTU DE N3WG K; Set b1 command. CMD></p>
cw <text>	<p>Set the text sent when the knob is rotated clockwise.</p> <p>Example output: CMD> cw UP2; Set encoder clockwise command. CMD></p>
cc <text>	<p>Set the text sent when the knob is rotated counter-clockwise.</p> <p>Example output: CMD> cc DN2; Set counter-clockwise command. CMD></p>
fcw <text>	<p>Set the text sent when the knob is rotated clockwise while in fast mode.</p> <p>Example output: CMD> fcw UP5; Set encoder fast clockwise command. CMD></p>
fcc <text>	<p>Set the text sent when the knob is rotated counter-clockwise while in fast mode.</p> <p>Example output: CMD> fcc DN5; Set encoder fast counter-clockwise command. CMD></p>

Make sure you “quit” from config mode when you’re finished configuring the device so the encoder works properly and you can use your rig control software of choice through the PigKnob.

PigKnob Operation

Pressing of any switch or rotation of the knob on the device will immediately send the string of text stored in EEPROM out of the radio’s serial port on the interface board.

When a computer is also connected to the interface board and the device is **not** in config mode, any data sent into the computer serial port on the interface board is immediately sent out the radio serial port to the radio. This allows you to run a rig control software package on your computer while still using the PigKnob.

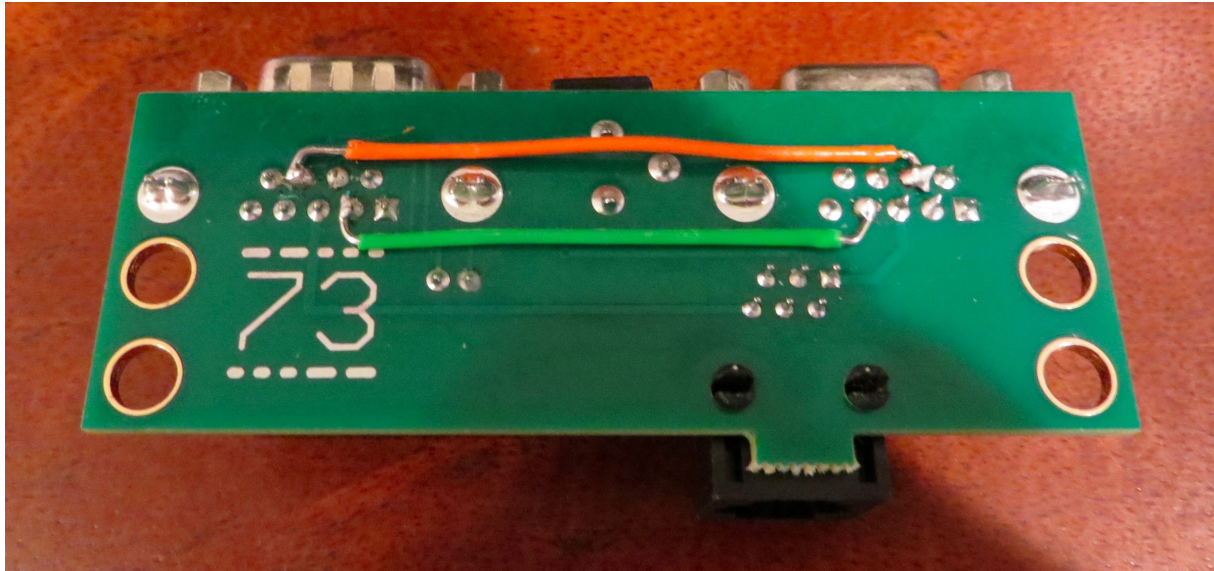
JP3

There is a jumper on the satellite interface board. When this jumper is shorted, pins 7 and 8 on the radio serial port are looped back into each other. This allows you to use the device with radios that require hardware flow control such as Kenwood transceivers. This is not true hardware flow control, it is simply faking it to the radio.

NOTE: DO NOT HAVE THIS JUMPER CONNECTED AND CONNECT TO AN ELECRAFT K2. YOU **WILL HURT THE RADIO; THE K2 DOES NOT HAVE STANDARD RS-232 SIGNALS ON THE KIO2 MODULE. WHEN IN DOUBT, DON'T USE THIS JUMPER UNTIL YOU VERIFY IN THE RADIO'S MANUAL THAT IT'S WHAT YOU NEED.**

DTR/RTS Keying

The first iteration of the PigKnob only passes pins 2 and 3 through to the radio from the computer. If you are using a contest type software package, like Win-Test, that has the capability to do PTT and Keying using the DTR/RTS signals this will not work without a hardware modification to add jumpers between pins 4 and 7 on the interface board.



Interface Board Mod for DTR/RTS Keying

The next revision of the PigKnob will most likely have a DIP switch that can be closed to connect these signals.

Encoder Lubrication

After prolonged use, the optical encoder used in the PigKnob can start to stick. This is due to the friction caused by the encoder shaft rubbing against the wall, the lubrication added by the encoder manufacturer can diminish. A quick shot of WD-40 onto the shaft will loosen it back up. The manufacturer of the encoder, CUI Inc., has confirmed and approved this fix.



***Remove the knob with a 5/64" allen wrench
Apply a small amount of WD-40 (or equivalent lubricant) to the shaft.
Clean off the excess.***

Schematic

PigKnob PCB

Revision History

Date	Version	Author	Reason for Change
20130420-20130425	0.1	N3WG	Initial Draft
20130429	0.2	N3WG	Add YouTube URL for Quick Start Clean Up
20130501	1.0	N3WG	Initial Release
20130526	1.0B	N3WG	Added information on hardware modification for DTR/RTS keying.
20140121	1.0C	N3WG	Added information about encoder lubrication.